

## *Preventing Downtime for E-911 Centers and PSAP Installations*

by **Tim Maghan**





## Executive Summary

Quick response time is essential in the world of E911. But when a PSAP can't process calls, or is shut down because of power issues, it impacts the safety of the community, city, or town it serves, putting lives at risk. Now more than ever, downtime is simply not an option.

This paper outlines ways to create a Total Protection Solution for different E911 types of sites and how to choose the best equipment to maximize the efficiency and reliability of your E911 equipment.

E911 systems have advanced rapidly over the past few years. Although the advancements have made PSAP response more reliable, they have led to higher costs for deployment, maintenance and repair. They have also led to the use of more delicate microprocessors and circuitry that are more susceptible to poor quality power. Power disturbances from the outside, such as lightning or transient noise from inside the facility on the power or communication cables, can have a significant impact on system performance and reliability.

To meet the demanding protection needs of today's microprocessor-based E911 systems, a Total Protection Solution is necessary. This solution provides a clean, quiet, and stable electrical environment for all power and communications paths. Proper bonding and grounding of the system, when combined with a complete protection solution, are key elements to the reliability, performance, and uptime of the E911 installation.

Achieving a Total Protection Solution requires that the system be installed according to the manufacturer's recommendations and that the appropriate protection devices are installed to protect all power and communications paths to the E911 system.

## The E911 Installations

In order to learn more about how to protect E911 equipment from power and communication line disturbances, and help them run at peak performance, we'll look at two basic installation types for E911 systems:

- A standard E911 site, where all equipment is located in one facility.
- A centralized site, where the back room equipment is installed and serves multiple off site and multiple PSAP locations are supported.

Both types of installations require total protection of the power and communication lines.

### Standard E911 Installation Site

In a typical E911 installation, a dedicated power panel is installed in the back room and dedicated outlets are installed for the switching equipment and operator answering points. Trunks or T-1s are installed and connect to the back room equipment via either copper cables or fiber (see fig. 1).

### Floor Workstations/Answering Positions

### E-911 Protection Equipment Back Room

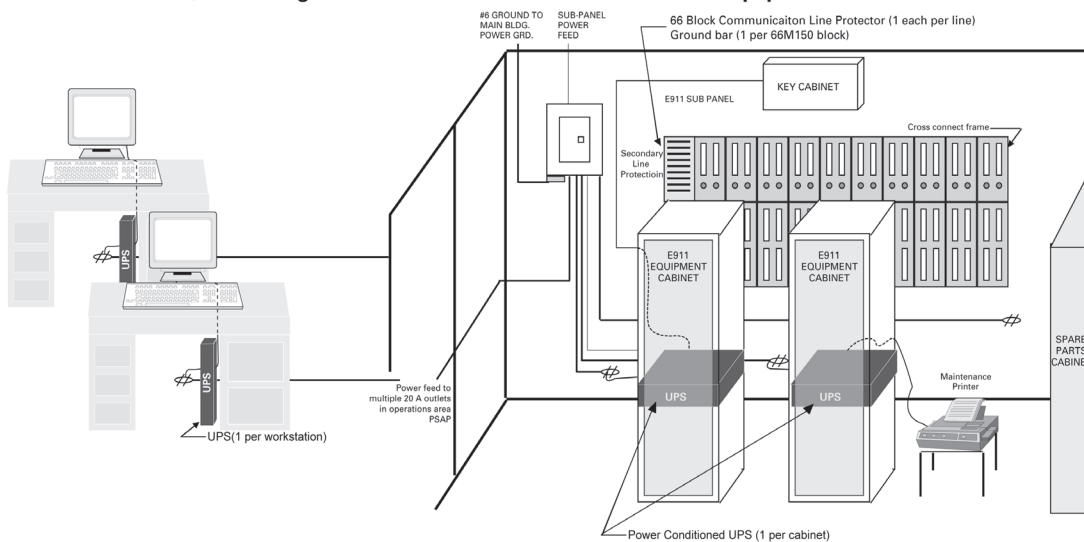


fig. 1. Standard E911 Installation Site

One power solution for this configuration is a single UPS installed to support the entire PSAP. However, most installations include one UPS for the back room equipment and individual UPSs for each answering point. Since transients can also be found on communication lines, all incoming trunks, T-1, or data pairs need to be protected by high performance secondary line protection.

### Hosted or Centralized E911 Sites

In a centralized applications, multiple remote PSAP locations are served by an single switch. Connections between the main switch and remote PSAPs is accomplished by using either fiber or copper cable pairs and gateways. Operator answering points are then connected to the gateway so that calls are processed by back room equipment at the remote centralized switch location (see fig. 2).

Even though the back room equipment is housed off site in this application, the remote equipment still needs to be protected. For a Total Protection Solution, protect each individual answering point with a UPS and all incoming trunks, T-1, or data pairs with high performance secondary protection. This ensures the remote equipment is totally protected.

## The Total Protection Solution

### UPS Power Protection

The first step in achieving a Total Protection Solution is to ensure that a power conditioned UPS with an isolation transformer and low let-through of line disturbances is installed in the back room to support the switching equipment. Additional UPSs need to be installed at each of the operator answering points to ensure that they can continue to respond during a power event.

Note: If the operator answering points incorporate dedicated outlets fed from the back room panel, an alternative is to install a single UPS that can support both the back room equipment and answering points.

Since the installation demands that the PSAP remain up and running to support the community, the selection of the UPS is critical. A UPS that provides protection down to the “chip level” is highly recommended. This assures that power is “continuously cleaned” and void of any unwanted power transients that can lead to degradation and eventual destruction of the system’s components.

It is critical to select a UPS that incorporates true continuous power conditioning, not just one that provides surge protection that allows dangerous transients to pass through to the critical equipment. Consumer grade UPSs, and many main stream commercial UPSs, allow 330 volts or more of transient noise to reach your equipment when transients are present on the main power lines. Such voltages can cause damage or lock-ups to the equipment with sensitive microprocessors.

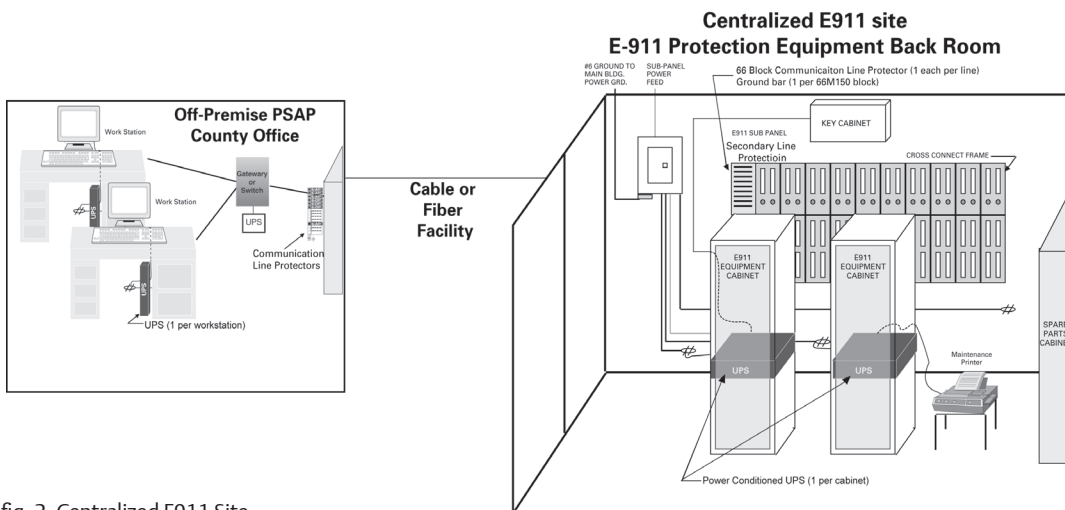


fig. 2. Centralized E911 Site

## Communications Line Protection

The next step in protecting your system is to install high performance secondary protection on all incoming trunks, data, or T-1 circuits. The telephone company is required by law to provide protection at the building entrance. But this protection is designed to protect against fire and human shock hazard and is NOT designed to protect sensitive back room electronics. In fact, the let-through voltage of these protectors typically exceeds 300 volts and will often exceeds 1000 volts. For this reason it is important to install secondary protection between the telephone company protectors and the back room equipment or gateway. Any off premise copper cable pairs that extend to other buildings or locations must also be protected as well. Selecting the right communication cable protection technology is just as critical as selecting the right UPS for protecting against power transients and other anomalies.

## Single Point Grounding

Finally, to achieve a true Total Protection Solution, it is very important that all components of the installation (including the protectors) are properly grounded to a single-point ground reference using at least 6 AWG ground wires. When installing the ground wiring, it's important to take the shortest and most direct route to the ground bus. Avoid sharp turns and bends in the ground wires and insure that the ground connections are secure. Maintain at least a six inch separation between

foreign ground wires, cross connect jumpers, power conduits, lights, etc.

If remote buildings are involved in the installation, and copper cable connects to exterior buildings, make sure that the cable sheaths are bonded and grounded at both building entrances as described in Article 800 of the National Electrical Code and that advanced secondary communication line protection is installed.

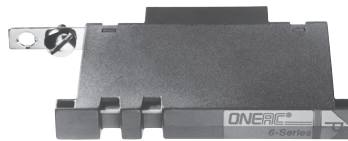
## Ongoing Maintenance

Once an installation is properly protected, it is critical to check and re-check the installation during each premise visit. Changes such as an additional trunk installation need to be protected so that it does not create a potentially damaging opening in the total protection scheme.

## Conclusion

Implementing a Total Protection Solution protecting both AC power and communication lines in an E911 installation ensures that power disturbances and transient energy does not disrupt PSAP performance. ONEAC AC Power works closely with leading installers and those who use an ONEAC Total Protection Solution have reported increased system performance and reliability with fewer service interruptions, less equipment failures, and far fewer service calls.

When there is no time for down time, Emerson Network Power ONEAC products are the clear solution for PSAP installations.



ONEAC Total Protection Solution Products

## About the Author

### **Tim Maghan**

Tim Maghan is currently a National Account Manager for ONEAC AC Power business of Emerson Network Power. He has been helping communication companies maximize the reliability and efficiency of their systems for over 30 years.

Tim has 39 years of experience in the telecommunications industry and 35 years experience in protecting mission critical electronics.



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